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EX PARTE

February 26, 1999

RECEIVED

FEB 26 1999

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Secretary - Federal Communications Commission
The Portals, 445 Twelfth St., SW
Washington, D.C., 20554

RE: CC Docket Nos. 96-45 and 97-160

Dear Ms. Salas,

Yesterday, representatives of the Benchmark Cost Proxy Model (BCPM) joint sponsors met with representatives of the Common Carrier Bureau staff with regard to the above referenced matters. In attendance for the BCPM joint sponsors were Whit Jordan, Bob McKnight, and Pete Martin of BellSouth, Peter Copeland and Ken Cartmell of USWest, and Kent Dickerson and Pete Sywenki of Sprint. Carl Laemmli, John Holmes, and Brian Staihr of Sprint joined via telephone. The attending Bureau staff members were Steve Burnett, Paula Cech, Katy King, Bob Loube, Craig Brown, Adrian Wright, Abdel Eqab, Richard Smith, Richard Kwiatkowski, and Bryan Clopton.

The purpose of the meeting was to discuss issues related to the inputs for use in the Commission's Synthesis Cost Model. In the meeting, we provided a response to several issues raised by AT&T/MCI in a February 9, 1999 ex parte submission, discussed common concerns of the BCPM sponsors with specific FCC preliminary input values, and provided our view as to the scope of applicability of the model and inputs. The attached information was provided to facilitate the discussion. On the issue of applicability of the model inputs, we voiced our concern with the selection of one set of inputs to be applied nationwide when there are legitimate carrier-specific, geography-specific, market-specific cost differences. At the very least, if a "one-size-fits all" set of inputs is adopted, the Commission needs to recognize the narrow applicability of the model and its inputs to federal universal service.

We request that this information be made a part of the record in the above referenced dockets. The original and three copies of this notice are being submitted to the Secretary of the FCC in accordance with Section 1.1206(a)(1) for this purpose. If there are any questions, please call.

Sincerely,

Peter Sywenki

Pete Sywenki

Attachment

cc: Craig Brown
Katie King
Bob Loube
Richard Kwiatkowski
Adrian Wright
Abdel Eqab
Richard Smith
Paula Cech
Bryan Clopton
Steve Burnett

Input Values for the FCC Synthesis Cost Model

- Issues with MCI/AT&T Ex Parte filing
  - Copper cable “material gauge adjustment” based on faulty logic that cost of copper cable is based on relative weight of cable. If this is true then shouldn’t a 2400 pair cable cost 200 X the cost of a 12 pair cable? Why not use actual cable cost comparisons?
  - Widespread use of 24 gauge cable over 400 pairs in actual practice. Why not appropriate for model use?
  - Sprint data clearly shows a 26 versus 24 gauge cost variance of approximately 20% vs. MCI/AT&T 35% recommendation. This does NOT apply to installation/engineering activities.
  - Comparison of 24 versus 26 gauge cable material costs:

		CABLE SIZE					
GAUGE	CABLE TYPE	600	900	1200	1800	2100	2400
24	Total Cable	4.66	6.76	9.04	13.41	15.83	19.14
26	Total Cable	3.73	6.10	6.32	10.44	12.52	15.33
Comparison to 24-gauge		80%	90%	70%	78%	79%	80%

Input Values for the FCC Synthesis Cost Model

- Issues with MCI/AT&T Ex Parte filing
  - Two principal errors in MCI/AT&T estimations of splicing cost
    - Splicing Productivity- RUS Data demonstrates average splicing productivity of 59 pairs/hour. Per MCI/AT&T cost data for a 100 pr cable(page 9 of ex parte)-
      $95.37/100 prs/$55/hr (AT&T labor rate)= 1.7 hrs/100 prs
      100 pairs spliced/1.7 hrs= 59 pairs spliced/hour
    - Splicing labor loading factor is applied against total HAI purported installed cable cost, not cost of material only
  - Correcting these two errors, using 60 pairs spliced/hour and Sprint actual cable material costs yields the following:

Input Values for the FCC Synthesis Cost Model

AT&T/MCI Chart With The Splicing Pairs Per Hour Changed to Reflect NRRI Productivity and Sprint Raw Cable Price

	Splicing Cost Per Foot									
	Standard Length (ft)			Splicing Labor						
Pairs	DCTZ	GFMW & GFTW	WA4AR	Splice Setup (hrs) *	Wire Work @ 45 Pairs/Hr	Total Hours	Cost/ Splice @ 55 /Hr	Splicing Cost Per Foot	Sprint Material $/Foot	Splicing Cost to HAI $/Ft
6			800		0.13	0.13	$7.33	$0.01	$0.18	5.1%
12			800		0.27	0.27	$14.67	$0.02	$0.28	6.5%
25		800			0.56	0.56	$30.56	$0.04	$0.34	11.2%
50		800			1.11	1.11	$61.11	$0.08	$0.57	13.4%
100		800			2.22	2.22	$122.22	$0.15	$0.95	16.1%
200		800			4.44	4.44	$244.44	$0.31	$1.74	17.6%
400		800			8.89	8.89	$488.89	$0.61	$3.28	18.6%
600		800			13.33	13.33	$733.33	$0.92	$4.72	19.4%
900		800			20.00	20.00	$1,100.00	$1.38	$6.90	19.9%
1200	800				26.67	26.67	$1,466.67	$1.83	$9.06	20.2%
1800	800				40.00	40.00	$2,200.00	$2.75	$11.10	24.8%
2400	800				53.33	53.33	$2,933.33	$3.67	$17.40	21.1%
3000	800				66.67	66.67	$3,666.67	$4.58	$17.57	26.1%
3600	800				80.00	80.00	$4,400.00	$5.50	$17.57	31.3%
4200	800				93.33	93.33	$5,133.33	$6.42	$17.57	36.5%
									Average	19.2%
									Median	19.4%

* Set-up has been zeroed out because the average splice productivity already includes set-up

- Contrast to MCI/AT&T suggested cost “adder” of 1% to 4.5% and NRRI's 9.4%

Input Values for the FCC Synthesis Cost Model

-- Splicing costs are best estimated using actual data. Appropriate metric is average cost/pair foot

Input Values for the FCC Synthesis Cost Model

- Issues with MCI/AT&T Ex Parte filing
  - DLC costs not based on actual vendor costs- opinion of "team of experts"
    - MCI/AT&T DLC costs 46% of actual Sprint costs
    - Preliminary SCM costs 60% of actual Sprint costs
    - Dramatic understatement of both material and installation costs by MCI/AT&T

Input Description	FCC Value	Sprint Value	HAI 5.0a	Newest AT&T/MCI
DLC (fixed cost of a 2016 line fiber terminal)	158,250	256,358	NA	NA
DLC (variable cost of a 2016 line fiber terminal)	83	*	53	78
DLC (fixed cost of a 672 line fiber terminal)	91,600	153,641	66,000	70,000
DLC (variable cost of a 672 line fiber terminal)	83	*	53	78
DLC (fixed cost of a 96 line fiber terminal)	29,850	32,862	NA	NA
DLC (variable cost of a 96 line fiber terminal)	97	*	100	NA
DLC (fixed cost of a 24 line fiber terminal)	24,750	27,672	NA	NA
DLC (variable cost of a 24 line fiber terminal)	97	*	100	NA

Input Values for the FCC Synthesis Cost Model

- Issues with MCI/AT&T Ex Parte filing
  - MCI/AT&T ignore several market realities
    - All Telecom Carriers pay same rate as CATV until year 2000
    - Beginning 2001 new rates for Telecom Carriers to be phased in over 5 year period
    - CATV providing "cable services" continue to pay rate based on 7.4% allocation
    - ILEC has no rights under section 224 with respect to poles of other utilities
  - MCI/AT&T ignore realities of Underground and Buried structure sharing; very little real-world opportunity exists

Input Values for the FCC Synthesis Cost Model

- Issues with MCI/AT&T Ex Parte filing
  - MCI/AT&T miss the point of providing updated real world switching data.
  - LEC data sets not based on an "embedded life cycle analysis" as purported by MCI/AT&T.
  - All data sets, NRRI, Mecurio-Sywek, etc. are based on "embedded data", which is obviously not "useless". Difference is in how it is applied on a forward-looking basis.
  - Point is ALL switching costs must be included; if the MDF was installed in 1960, it doesn't go away; a forward looking cost construct cannot ignore required investment. Similarly processor upgrades required subsequent to initial digital conversion are required to ensure forward-looking Switch Technology.
  - Previously incurred switching costs CAN be adjusted to reflect declining switch costs over time using the Turner Plant Index or similar methodology.

Input Values for the FCC Synthesis Cost Model

- Joint Sponsor Concerns
  - Expenses
    - SCM methodology drastically understates General support expense; should be stated on basis of monthly expense per line.
    - Network operations expense substantially understated. Loop component of Sprint's proposed input alone is significantly higher than HCPM input. Loop component is $2.29; total local service Network Ops expense for Sprint: Sprint $2.93 vs. HCPM $1.47
    - Customer service input substantially understates expense.

Input Values for the FCC Synthesis Cost Model

- MCI/AT&T claims regarding Minimum Spanning Tree calculation are unfounded, misleading, inaccurate and nothing new
- According to HAI Sponsors, MST is excessive: Steiner Tree argument, surrogates more dispersed than actual points
- These points addressed in attached documentation
- HAI's new argument: HCPM clustering allows for "beeline routing" of cable (HAI Sponsors' page 3)
- If so, HCPM clustering is unique in history of statistical analysis (Congratulations!)
- New argument is completely without foundation (see attached documents)

Input Values for the FCC Synthesis Cost Model

- Gain understanding of rationale behind most recent staff input changes
  - Digital Loop Carrier (DLC) costs
  - Cable Pricing
  - Switching Costs
    - Trunk Occupancy
    - Average Fill factor
  - Other

Input Values for the FCC Synthesis Cost Model

- Review proposed Transport and Signaling module changes
- Clarify applicability of the Synthesis Model

Input Values for the FCC Synthesis Cost Model

Prepared by the BCPM Sponsors
BellSouth, Sprint, and U S WEST

February 25, 1999

Input Values for the FCC Synthesis Cost Model

Joint Sponsor Primary Areas of Concern

- Provide rebuttal of MCI/AT&T Ex Parte filing
- Review other joint sponsor concerns
- Review proposed Transport and Signaling module changes
- Provide clarification why Minimum Spanning Tree (MST) calculation is accurate, necessary, and useful when determining cable length requirements
- Gain understanding of rationale behind most recent staff input changes
- Clarify applicability of the Synthesis Model

Calculation of Pair Splicing Productivity From NRRI Data

	Pairs Spliced Per Hour	A Average Cost/100 Pairs Spliced[1]	B Hourly Rate for Cable Splicer[2]	C Hours to Splice 100 Pairs (=A/B)	D Pairs Spliced Per Hour (=100/C)	E Percent of NRRI Activity[3]	F Weighted Average (=D*E)
Non-Modular Splicing	**43**	$128.53	$55.00	2.34	42.79	84%	35.94
Modular Splicing	**58**	$95.37	$55.00	1.73	57.67	16%	9.23
Weighted Average	**45**					100%	45.17

[1]Based on calculation from AT&T/MCI 2/8/99 Ex Parte, page 9
[2]Based on calculation from AT&T/MCI 2/8/99 Ex Parte, page 9
[3]Based on calculation from AT&T/MCI 2/8/99 Ex Parte, page 9

Calculation of Pair Splicing Productivity From NRRI Data

Original AT&T/MCI Chart

Splicing Cost Per Foot										
	Standard Length (ft)			Splicing Labor						
Pairs	DCTZ	GFMW & GFTW	WA4AR	Splice Setup (hrs)	Wire Work @ 300 Pairs/Hr	Total Hours	Cost/ Splice @ 55 /Hr	Splicing Cost Per Foot	HAI Default $/Foot	Splicing Cost to HAI $/Ft
6			800	0.5	0.1	0.6	$33.00	$0.04	$0.63	6.5%
12			800	0.5	0.1	0.6	$33.00	$0.04	$0.76	5.4%
25		800		1.0	0.1	1.1	$59.58	$0.07	$1.19	6.3%
50		800		1.0	0.2	1.2	$64.17	$0.08	$1.63	4.9%
100		800		1.5	0.3	1.8	$100.83	$0.13	$2.50	5.0%
200		800		1.5	0.7	2.2	$119.17	$0.15	$4.25	3.5%
400		800		2.0	1.3	3.3	$183.33	$0.23	$6.00	3.8%
600		800		2.0	2.0	4.0	$220.00	$0.28	$7.75	3.5%
900		800		2.0	3.0	5.0	$275.00	$0.34	$10.00	3.4%
1200	800			2.0	4.0	6.0	$330.00	$0.41	$12.00	3.4%
1800	800			2.0	6.0	8.0	$440.00	$0.55	$16.00	3.4%
2400	800			3.0	8.0	11.0	$605.00	$0.76	$20.00	3.8%
3000	800			3.0	10.0	13.0	$715.00	$0.89	$23.00	3.9%
3600	800			4.0	12.0	16.0	$880.00	$1.10	$26.00	4.2%
4200	800			4.0	14.0	18.0	$990.00	$1.24	$29.00	4.3%
									Average	**4.4%**
									Median	**3.9%**

Splice Productivity Input	300	0.20
Splicing Hourly Labor Rate Input	$55.00	

Calculation of Pair Splicing Productivity From NRRI Data

AT&T/MCI Chart With The Splicing Pairs Per Hour Changed to Reflect NRRI Productivity and Sprint Raw Cable Price
100% Modular Splicing

Splicing Cost Per Foot										
	Standard Length (ft)			Splicing Labor						
Pairs	DCTZ	GFMW & GFTW	WA4AR	Splice Setup (hrs) *	Wire Work @ 57.6701268742791 Pairs/Hr	Total Hours	Cost/ Splice @ 55 /Hr	Splicing Cost Per Foot	Sprint Material $/Foot	Splicing Cost to HAI $/Ft
6			800		0.10	0.10	$5.72	$0.01	$0.18	4.0%
12			800		0.21	0.21	$11.44	$0.01	$0.28	5.1%
25		800			0.43	0.43	$23.84	$0.03	$0.34	8.8%
50		800			0.87	0.87	$47.69	$0.06	$0.57	10.5%
100		800			1.73	1.73	$95.37	$0.12	$0.95	12.5%
200		800			3.47	3.47	$190.74	$0.24	$1.74	13.7%
400		800			6.94	6.94	$381.48	$0.48	$3.28	14.5%
600		800			10.40	10.40	$572.22	$0.72	$4.72	15.2%
900		800			15.61	15.61	$858.33	$1.07	$6.90	15.5%
1200	800				20.81	20.81	$1,144.44	$1.43	$9.06	15.8%
1800	800				31.21	31.21	$1,716.66	$2.15	$11.10	19.3%
2400	800				41.62	41.62	$2,288.88	$2.86	$17.40	16.4%
3000	800				52.02	52.02	$2,861.10	$3.58	$17.57	20.4%
3600	800				62.42	62.42	$3,433.32	$4.29	$17.57	24.4%
4200	800				72.83	72.83	$4,005.54	$5.01	$17.57	28.5%
									Average	**15.0%**
									Median	**15.2%**

* Set-up has been zeroed out because the average splice productivity already includes set-up

Splice Productivity Input	58	1.04
Splicing Hourly Labor Rate Input	$55.00	

Calculation of Pair Splicing Productivity From NRRI Data

AT&T/MCI Chart With The Splicing Pairs Per Hour Changed to Reflect NRRI Productivity and Sprint Raw Cable Price

Mixed Splicing Methods Splicing

Splicing Cost Per Foot										
	Standard Length (ft)			Splicing Labor						
Pairs	DCTZ	GFMW & GFTW	WA4AR	Splice Setup (hrs) *	Wire Work @ 45.172135 883795 Pairs/Hr	Total Hours	Cost/ Splice @ 55 /Hr	Splicing Cost Per Foot	Sprint Material $/Foot	Splicing Cost to HAI $/Ft
6			800		0.13	0.13	$7.31	$0.01	$0.18	5.1%
12			800		0.27	0.27	$14.61	$0.02	$0.28	6.5%
25		800			0.55	0.55	$30.44	$0.04	$0.34	11.2%
50		800			1.11	1.11	$60.88	$0.08	$0.57	13.4%
100		800			2.21	2.21	$121.76	$0.15	$0.95	16.0%
200		800			4.43	4.43	$243.51	$0.30	$1.74	17.5%
400		800			8.86	8.86	$487.03	$0.61	$3.28	18.6%
600		800			13.28	13.28	$730.54	$0.91	$4.72	19.3%
900		800			19.92	19.92	$1,095.81	$1.37	$6.90	19.9%
1200	800				26.57	26.57	$1,461.08	$1.83	$9.06	20.2%
1800	800				39.85	39.85	$2,191.62	$2.74	$11.10	24.7%
2400	800				53.13	53.13	$2,922.16	$3.65	$17.40	21.0%
3000	800				66.41	66.41	$3,652.69	$4.57	$17.57	26.0%
3600	800				79.70	79.70	$4,383.23	$5.48	$17.57	31.2%
4200	800				92.98	92.98	$5,113.77	$6.39	$17.57	36.4%
									Average	**19.1%**
									Median	**19.3%**

* Set-up has been zeroed out because the average splice productivity already includes set-up

Splice Productivity Input	45	1.33
Splicing Hourly Labor Rate Input	$55.00	

OVERVIEW—MST Issues and the Synthesis Model (SM)

In their document dated 2/9/99 the HAI Sponsors present a series of arguments regarding the use of the minimum spanning tree (MST) in the FCC's proxy model. The majority of their objections fall into very familiar categories:

According to the HAI Sponsors...

- A minimum spanning tree represents more cable than is required, and so it isn't an appropriate standard for use in the FCC's Synthesis Model (SM).
- The *reason* the MST represents more cable than required is that it's possible to connect a series of points with less than the MST (the Steiner tree argument).
- Another reason the MST is more than required is that road surrogate points are more dispersed than geocoded points, so a MST that connected surrogate points would more than connect geocoded points.

Rather than respond to each of these points again, Sprint has attached 5 documents below that are on record in various state proceedings. These documents address several of these points with real world examples. The front sheet of each is a summary of the main point in the document.

However, a direct response is required to two specific points. First, the HAI Sponsors have added a new argument to their repertoire, found on page 3 of their February 9th document:

Indeed, because distribution areas are formed by a clustering algorithm that attempts only to aggregate closely situated points...it is likely that identified distribution areas will not contain significant barriers to the beeline routing of cables.

—Input Values Issues, AT&T and MCI World/Com, page 3

This argument is completely without foundation and clearly agenda-driven. A thorough examination of the SM's 1) clustering algorithms, 2) supporting documentation, and 3) results reveals absolutely no support for the statement above.

Setting aside user-defined constraints such as line counts, the SM's determination and creation of clusters is completely Euclidean distance-based in both the initial clustering routine and the follow-up reassignment routines (see *The Hybrid Cost Proxy Model Customer Location and Loop Design Modules*, pp.5-7).

- There is nothing built into either routine to suggest that barriers to "beeline" routing are somehow avoided or minimized in the process of clustering. In fact, bi-dimensional (or even multi-dimensional) agglomerative clustering as a statistical method is incapable of incorporating a constraint such as "minimize barriers to beeline routing" unless the points being clustered could somehow be parameterized to reflect the likelihood of such barriers, which the HCPM points are not.
- Neither is there anything in the clustering results to suggest that barriers do not exist within the clusters OR that because of their size, shape, location, etc. barriers are somehow less likely in these clusters than they are in reality. In fact, despite attempting *"only to aggregate closely situated points"* the Synthesis Model produces thousands of clusters that are over 10 square miles in area, many up to 15 and 17 square miles.
- Sprint respectfully requests that the HAI Sponsors explain exactly what evidence exists to support their statement above.
- In the absence of any clear evidence, Sprint hopes the FCC will continue to recognize that even forward-looking, least-cost, efficiently-modeled telephone plant must consider natural barriers, rights-of-way, topography, regulatory barriers, road constraints and more. Because these factors determine the actual conditions under which a new and efficient provider would operate, these factors must be included when calculating that new, efficient provider's costs.

- And because the MST (and "beeline routing") consider NONE of these factors, it is clear that some positive adjustment to the length of the MST must be made for a given area. This is discussed and supported in the attached documents.

Point #2: The HAI Sponsors again claim that road surrogate points are more dispersed than (geocoded) actual customer locations. Because of this, it is suggested that the required amount of cable could be something less than the MST associated with the points that are used in the model.

In other words, the HAI Sponsors appear to be suggesting the following: *"The points are in the wrong place, so the model doesn't need to build enough cable to reach them."*

Despite the HAI Sponsors' reference to a June *ex parte* presentation, there is still conflicting evidence on this issue. And the choice before the FCC is straightforward, given the following facts...

- For most any given wire center there will be clusters created from all geocoded points, all surrogate points, and combinations of the two.
- If the HAI argument is correct, the MST is more suitable (as a length guideline) for clusters containing 90% geocoded / 10% surrogate points than for another cluster containing 50% geocoded / 50% surrogate points.
- However, this would not be true if the cluster made up of 50% geocoded / 50% surrogate had its *perimeter* defined by geocoded points, with the surrogate points falling in the cluster's interior. In that case, to make some kind of downward adjustment in length to reflect the existence of surrogate points would result in truly understating the *required* cable. The network constructed by the model would not be a functioning network, thereby not meeting the FCC's own guidelines for proxy models.
- According to PNR & Associates, the number and ratio of geocoded / surrogate points per cluster is proprietary information. Therefore there is no way for all parties

to know the extent to which underbuilding will occur if the HAI suggestion is followed.

- Given these facts, the FCC can either 1) use the MST as a length guideline and be relatively assured that the network constructed in the model actually functions, thereby meeting their own criteria; or 2) follow the HAI Sponsors' suggestion and be assured that significant portions of the network will not function.

DOCUMENT #1

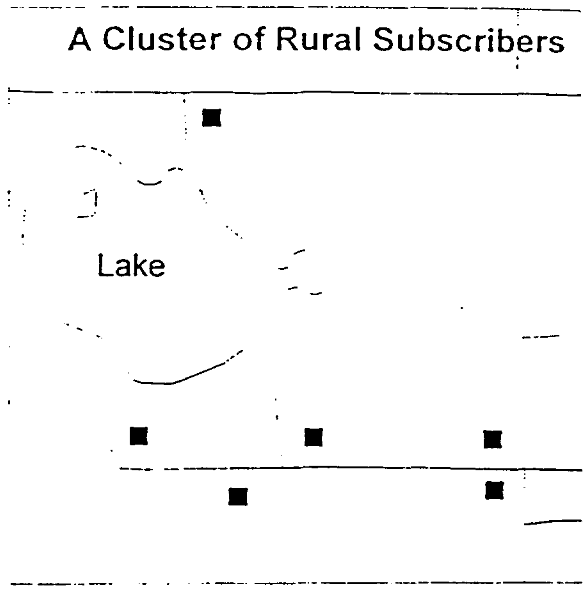
GENERAL DISCUSSION OF MINIMUM SPANNING TREE VS. ACTUAL CABLE ROUTE

INCLUDED IN THE FLORIDA PUC DOCUMENT (DOCKET #980696-TP) CITED BY THE HAI SPONSORS IN FOOTNOTE 2 ON PAGE 2 OF THEIR 2/9/99 DOCUMENT.

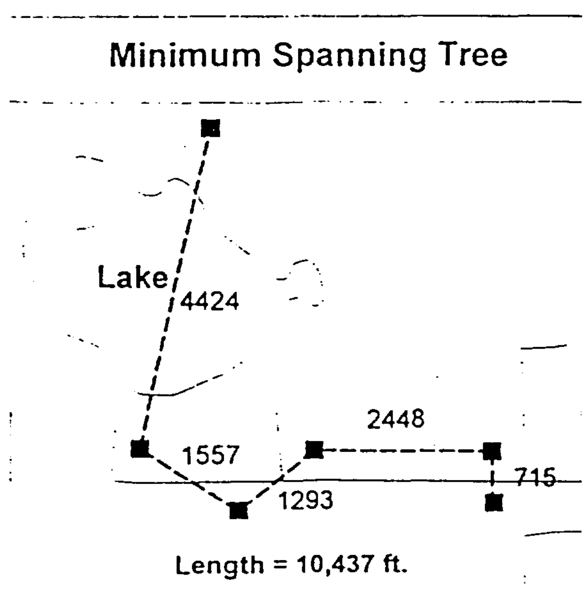
KEY POINT:
REALISTICALLY, SOME MULTIPLIER MUST BE APPLIED TO A MINIMUM SPANNING TREE TO REFLECT THE LENGTH OF CABLE REQUIRED TO ACTUALLY SERVE LOCATIONS, GIVEN NATURAL AND MAN-MADE BARRIERS TO "BEELINE" CABLE ROUTING.

III. Minimum Spanning Tree vs. Actual Cable Route

Here is an example of the relation of Minimum Spanning Tree and a possible cable route to serve a cluster of subscribers in a rural area.



We must remember that Minimum Spanning Tree is an arbitrary, mathematical measure that has no respect for natural obstacles nor humanly restricted of rights-of-way. It simply measures the straight-line distance from one subscriber point to another, using the shortest set of straight lines possible. If that should lead through a cow pasture, a body of water, or a high mountain, the calculation does not care. And it certainly does not consider that cables basically run along roads ... the calculation makes use of nothing other than the location of each of the points, and the distance of each point from each other.



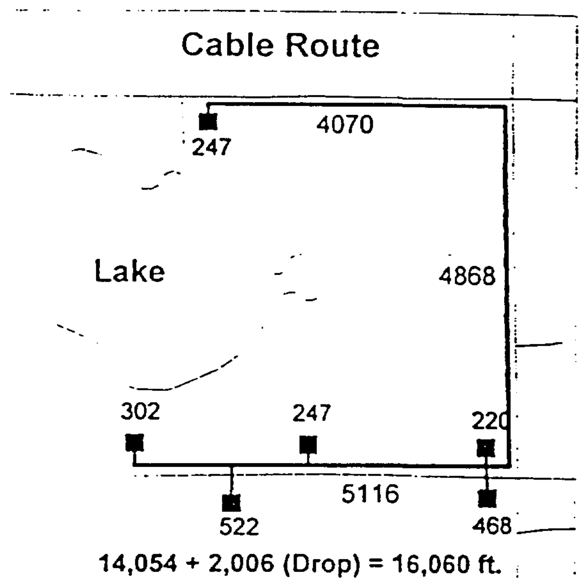
So the Minimum Spanning Tree that would be produced for this configuration of subscribers is as shown at the right. The line segments connect the points from one to another, always with a straight line, and always using the shortest set of line segments possible. The fact that several of these line segments run obliquely across a road is natural ... the calculation is not even aware of roads. And the fact that one of the segments runs across a lake is, once again, a natural result of a mathematical procedure that always seeks the shortest straight-line distances and knows nothing of obstacles.

Here we have shown the length, in feet, of each of the line segments of the Minimum Spanning Tree. The total length is 10,437 feet. We will be hard pressed to devise a realistic cabling route that can match that length, because cable routes – unlike abstract mathematical procedures – are compelled to honor natural and man-made restrictions.

The cable route is compelled to follow roads. In this case, we have run the cable along the side of the road that favors the largest number of subscriber points. We show here the length of each length of distribution cable, and the length of each drop. We find that to correspond to the connections of the Minimum Spanning Tree, we must use 14,054 feet of distribution cable and 2,006 feet of drops, a total of 16,060 feet.

Clearly this length is greater than that of the Minimum Spanning Tree for this set of points, just as we would expect it to be. In this case, the 16,060 feet is 1.54 times the Minimum Spanning Tree length of 10,437 feet, a significant multiplier.

The multiplier will vary with different configurations of subscribers in different natural and man-made settings. But it should be clear that except in the most trivial of circumstances the route distance is certain to be more than 1.0 times the Minimum Spanning Tree length.



DOCUMENT #2

BRIEF RESPONSE TO HAI SPONSORS' EX PARTE 6/10/98 DISCUSSING POSSIBILITY OF TELEPHONE NETWORK USING LESS CABLE THAN THE LENGTH OF THE ASSOCIATED MINIMUM SPANNING TREE.

ALSO INCLUDED IN THE FLORIDA PUC DOCUMENT CITED BY THE HAI SPONSORS IN FOOTNOTE 2 ON PAGE 2 OF THEIR 2/9/99 DOCUMENT.

KEY POINT:
ALTHOUGH THE ADDITION OF NODES (THE STEINER TREE ARGUMENT) CAN IN SOME CASES RESULT IN A REQUIRED DISTANCE LESS THAN THE MST, IN THE MAJORITY OF INSTANCES CONCERNING GROUPS OF POINTS > 5 (AND IN THE EXAMPLE CITED BY THE HAI SPONSORS) THIS IS NOT THE CASE.

The "Shorter-Than-Minimum-Spanning-Tree" Fallacy

By Phil Bolian, Stopwatch Maps
For *INDETEC* International

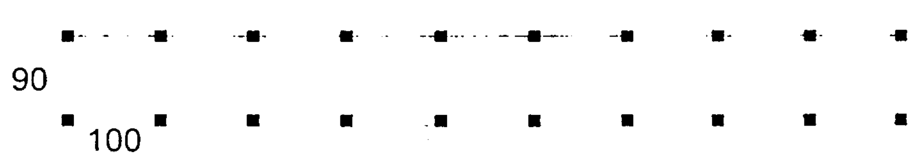
It is certainly true that the classic Minimum Spanning Tree construct allows branches only at the existing nodes of a graph. It is also true that – in a few very special cases – the deliberate insertion of additional nodes might produce a slightly shorter tree than the Minimum Spanning Tree. In a telephone network, additional nodes may be introduced at will. Thus one might argue that it is at least *conceivable* that some cabling in a telephone network could be slightly shorter than the measure of a Minimum Spanning Tree. That argument would certainly require an example to illustrate the case. However, such examples are difficult to develop.

In a June 10, 1998 ex parte to the FCC, AT&T and MCI present an example purportedly illustrating part of a telephone network that uses less cable footage than the measure of the Minimum Spanning Tree for the subscribers to be served. The example is based on the premise that on a typical suburban street, running cable down one side (or the middle) of the street, and extend drops to each house, will yield less DRD [Distribution Route Distance] than the Minimum Spanning Tree distance.

Unfortunately for AT&T and MCI, the example they cite does *not* prove their point. In fact, it proves them wrong. Let's examine the circumstances AT&T and MCI cite.

Imagine a suburban block, with ten houses on either side of the street. Imagine them evenly spaced. In this first example, let the lot sizes be 100 feet, and let the distance from the front of one house to its cross-street neighbor be 90 feet (in a later example we'll reverse those distances). The Minimum Spanning Tree length for these original locations is 1,800 feet.

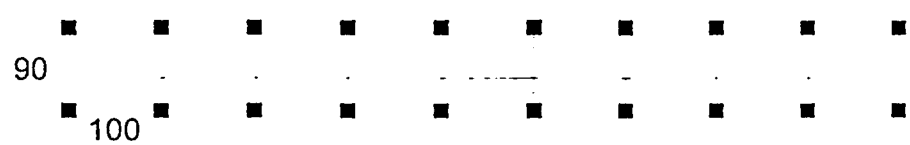
Minimum Spanning Tree



9 x 100 + 10 x 90 = 1800 ft

Now, if a single cable is run down one side (or the middle) of the street, and drops are extended to each house, the following configuration results. In this case, the DRD is *identical* to that for the Minimum Spanning Tree.

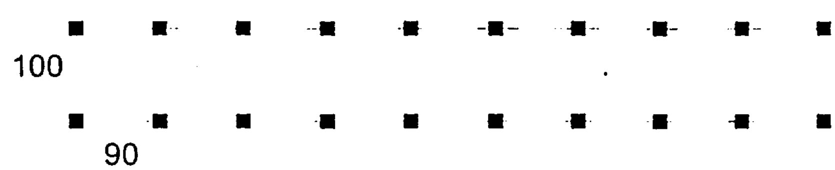
Distribution and Drops



9 x 100 + 10 x 90 = 1800 ft

Now, let's reverse the numbers, such that the lot size is 90 feet and the distance to a cross-street neighbor is 100 feet.

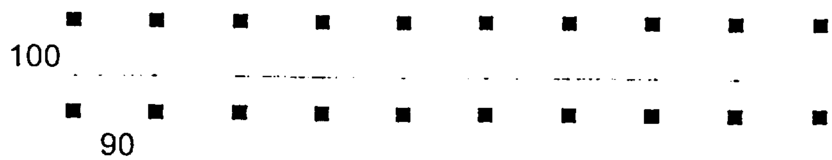
Minimum Spanning Tree



100 + 9 x 90 + 9 x 90 = 1720 ft

The Minimum Spanning Tree by necessity runs the full block length through the houses on both sides of the street. In this case, when we construct the distribution and drop configuration we find that it is *longer*, not shorter, than the Minimum Spanning Tree. The Minimum Spanning Tree is, to be exact, 5% shorter than the configuration AT&T and MCI cite.

Distribution and Drop



$$9 \times 90 + 10 \times 100 = 1810 \text{ ft}$$

Hence, it is quite difficult to improve upon the Minimum Spanning Tree distance.

DOCUMENTS #3, #4, #5

CALCULATION OF RATIO BETWEEN MINIMUM SPANNING TREE AND ACTUAL DISTRIBUTION-PLUS-DROP CABLE ROUTES:
#3, TWO IN TOWN AREAS IN MARSHALL MN
#4, MST VS. DISTRIBUTION + DROP IN CRYSTAL MN
#5, MST AND CABLING IN A RURAL AREA

FILED WITH THE MINNESOTA PUC COSTING PROCEEDING BY BCPM SPONSORS (DOCKET #P-442, 5321, 3167, 466, 421/CI-96-1540) IN 1998.

KEY POINTS:
ACTUAL CABLE LENGTHS WERE TAKEN FROM US WEST SERVING TERRITORY USING AERIAL PHOTOGRAPHS (FOR LOCATIONS) PLUS ACTUAL CABLE RUNS.
RESULT: IN MORE DENSE AREAS, THE RATIO OF ACTUAL CABLE TO MST RANGED FROM 1.6 TO 2. IN LESS DENSE AREAS, THE RANGE OF THE RATIO WAS 1.17 TO 1.27.

Two In-Town Areas in Marshall, MN

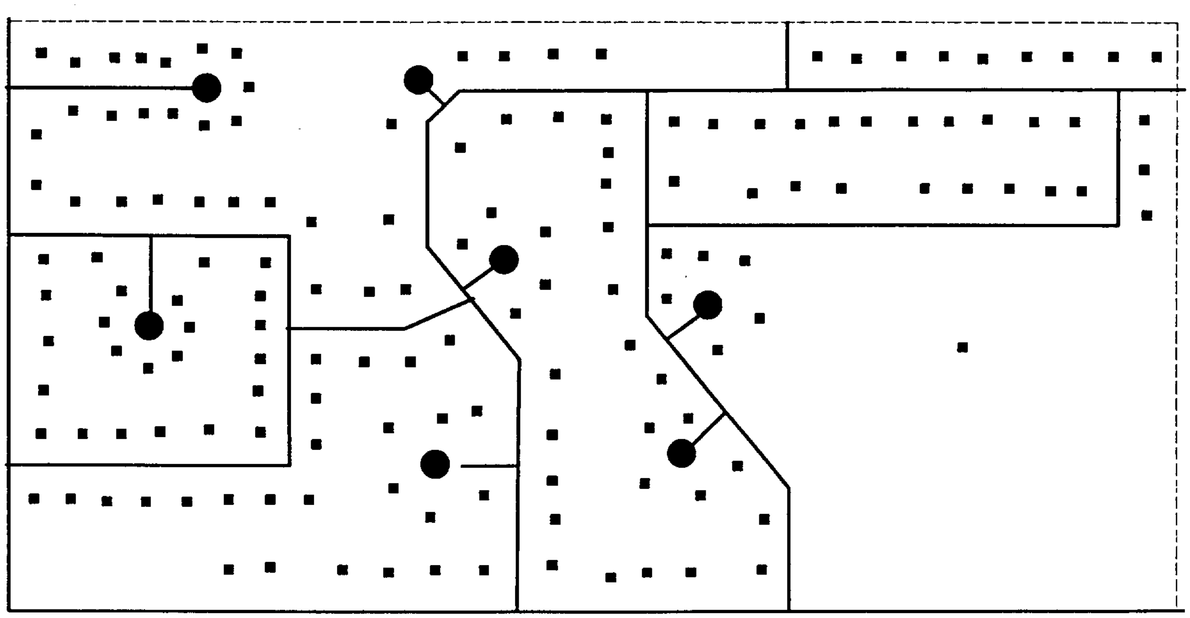
In order to get a handle on a realistic ratio between the length of a Minimum Spanning Tree and actual distribution-plus-drop cabling, we have examined two randomly chosen areas from within the town of Marshall, MN (Lyon County).

We used high resolution aerial photographs of each area and anchored each to an existing electronic map. We hand placed the individual subscriber points onto the electronic map, using the aerial photographs as source, and we determined the Minimum Spanning Tree of those subscriber points.

We then used another paper map of telephone easements, indicating the actual run of distribution cable, and transcribed these runs to the same electronic map. We measured the length of the distribution cable.

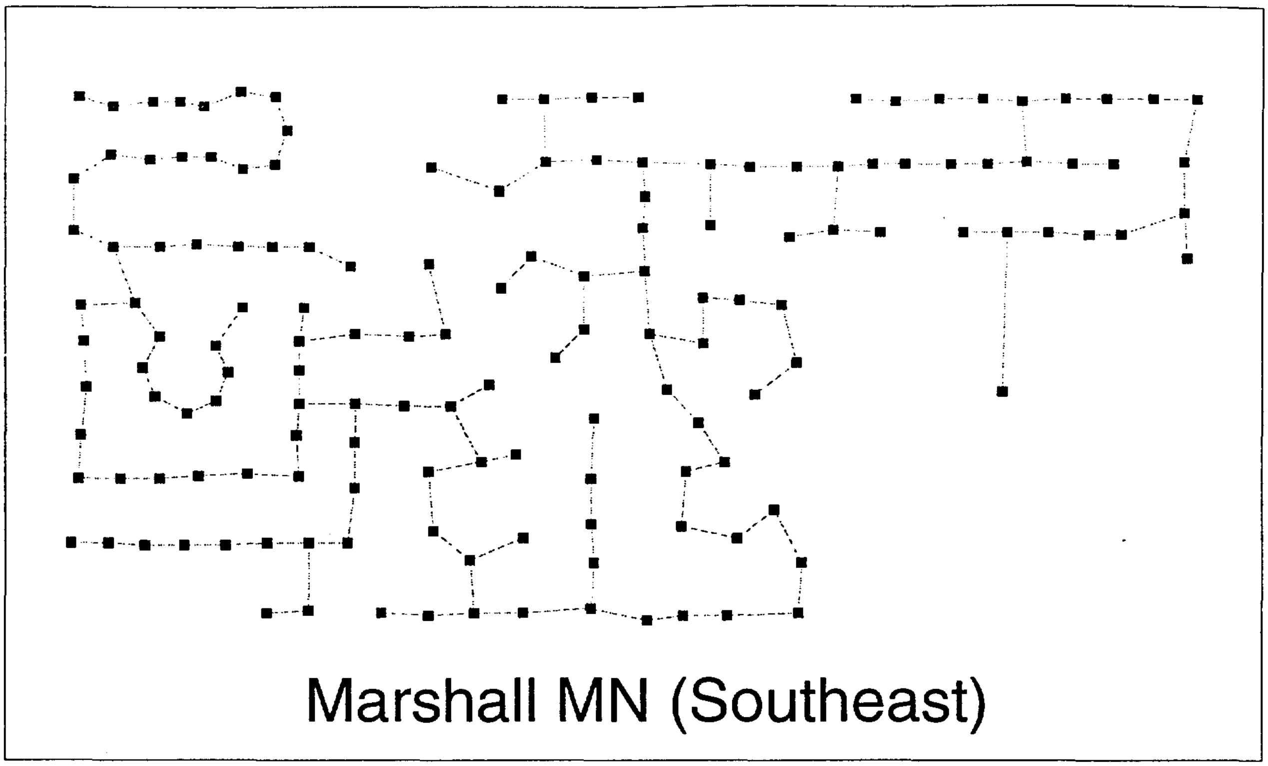
Because we hand placed each of the subscriber points, we knew that our freehand work would cause the drop lengths to be imprecise. Therefore, instead of measuring drop lengths from our own placement of subscribers, we used for our measurement the average drop length for the density zone as proposed by the DPS, and also the drop length proposed in the direct testimony of Bill Fitzsimmons. Because both of the areas studied have a density in the 850-2550 per square mile zone, each drop length is considered to be 90 feet (using the DPS number) or 107 feet (using Bill Fitzsimmons' number). We calculate both ways.

Let us first look at an area in the southeast of Marshall. It has 151 subscriber locations, for a density of 1,716 per square mile of area covered.

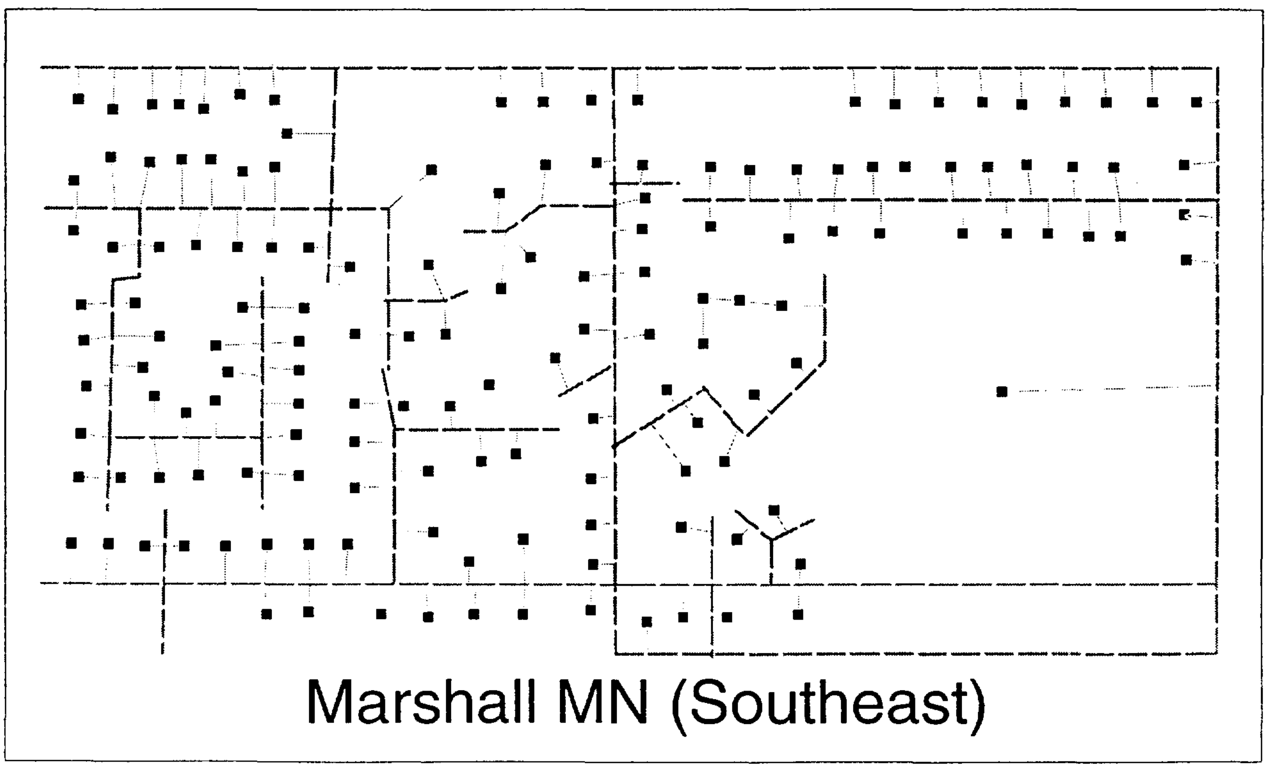


Marshall MN (Southeast)

We determine the Minimum Spanning Tree and calculate its length as 15,706 feet.



We then lay in the distribution (heavier broken line) and drop (lighter line) cables.



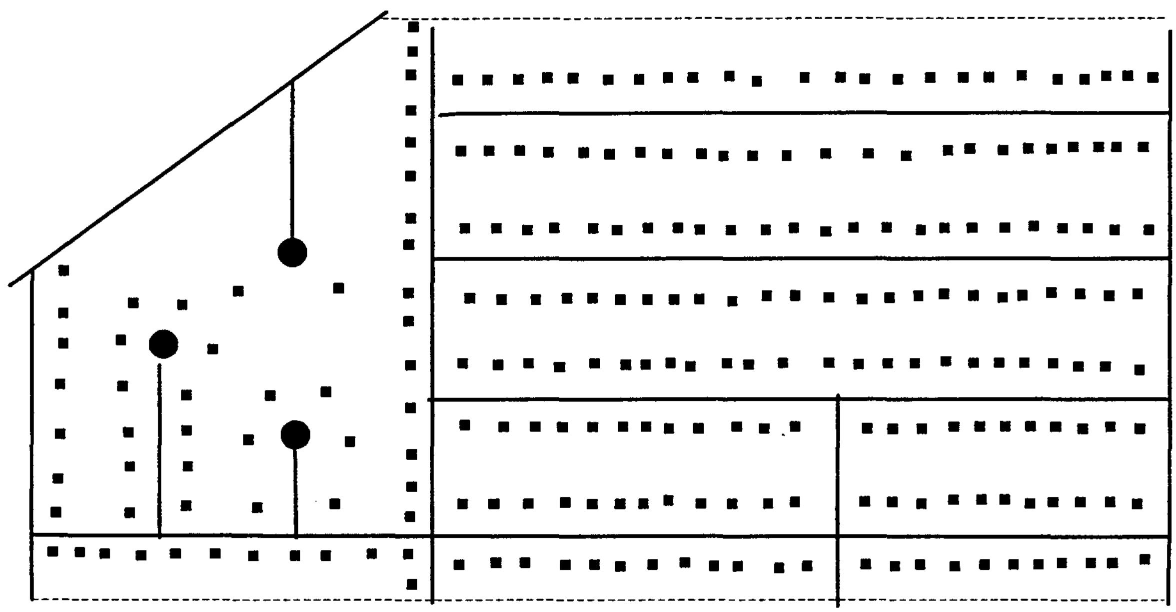
We measure the distribution cable length and find it to be 17,236 feet. Drops for 151 subscriber locations are 13,590 feet (DPS: 90 x 151) or 16,157 feet (Fitzsimmons: 107 x 151).

The comparisons of cable length to Minimum Spanning Tree, then, would be as follows (the first column uses the DPS drop length, the second the Fitzsimmons drop length):

Minimum Spanning Tree	15,706 ft.	15,706 ft.
Distribution Cable	17,236 ft.	17,236 ft.
Drops	13,590 ft.	16,157 ft.
	------------	------------
Distribution plus drops	30,826 ft.	33,393 ft.
Actual-to-MST Multiplier	1.96	2.13

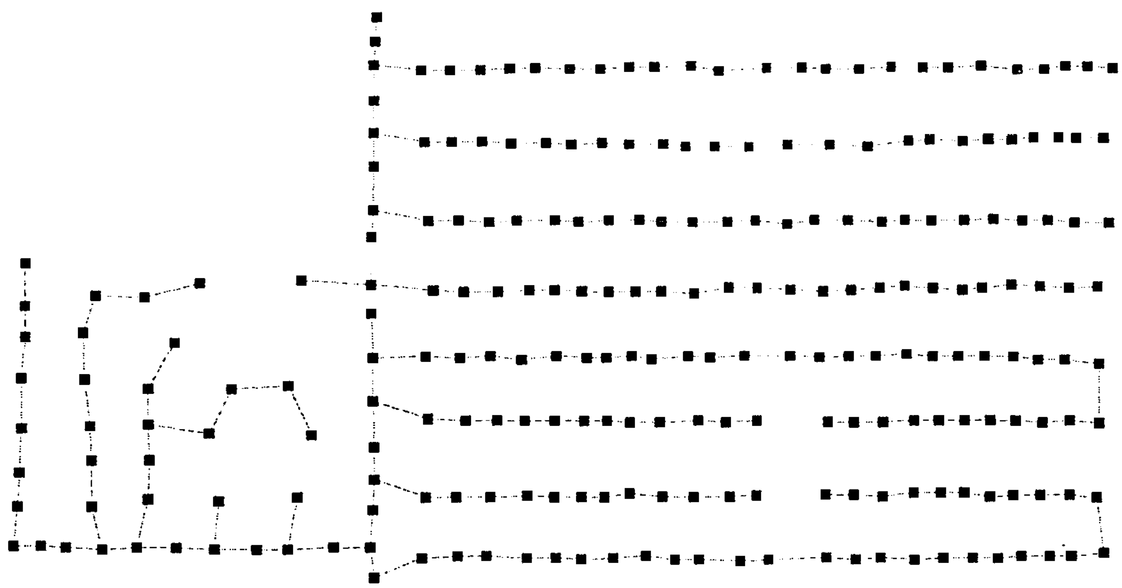
We should not be surprised that the multiplier approaches (or even exceeds) 2 ... in urban areas there are more man-made restrictions in the routing of cable than in rural areas.

We now look at an even denser area in the southwest part of Marshall. This area has 255 subscriber points, with a density of 2,390 per square mile of area covered.



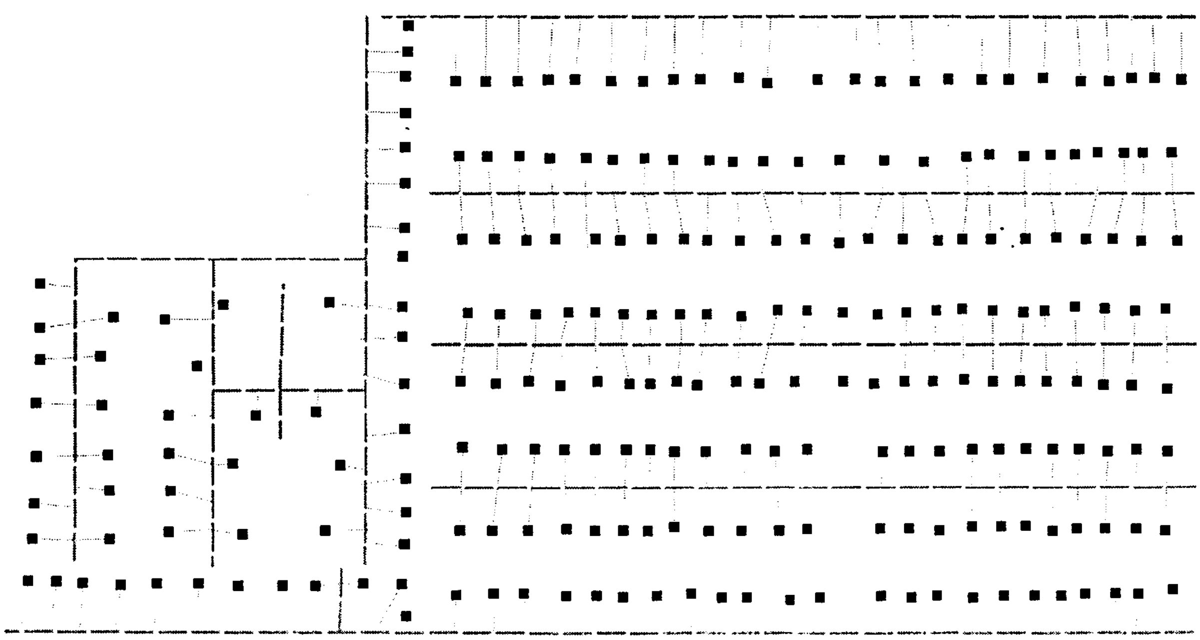
Marshall MN (Southwest)

First, we determine the Minimum Spanning Tree of this set of points, and find that to be 18,114 feet.



Marshall MN (Southwest)

We then lay distribution cable per map of easements, and find that distribution length to be 13,167 feet. Drops for 255 subscriber locations are 22,950 feet (DPS: 90 x 255) or 27,285 feet (Fitzsimmons: 107 x 255).



Marshall MN (Southwest)

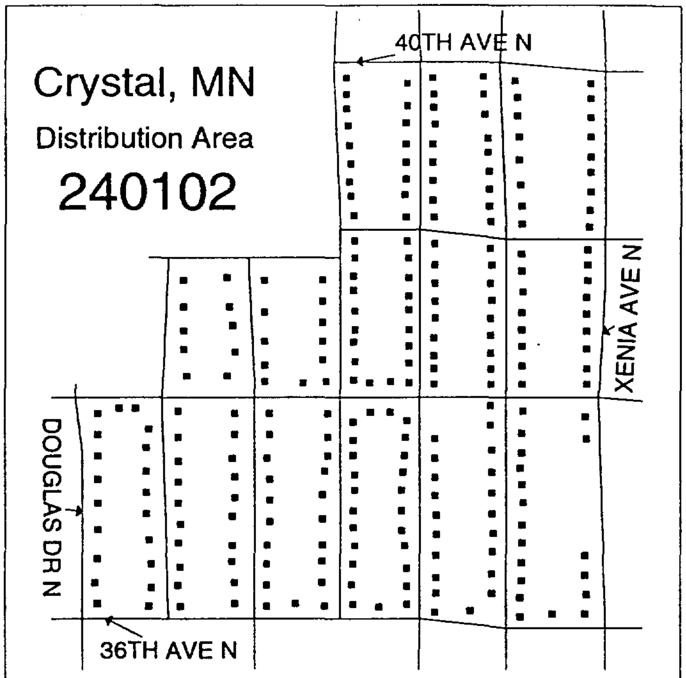
Once again we summarize the comparisons numerically (the first column uses the DPS drop length, the second the Fitzsimmons drop length):

Minimum Spanning Tree	18,114 ft.	18,114 ft.
Distribution Cable	13,167 ft.	13,167 ft.
Drops	22,950 ft.	27,285 ft.
	------------	------------
Distribution plus drops	36,117 ft.	40,452 ft.
Actual-to-MST Multiplier	1.99	2.23

Once again, a settled in-town area yields an approximately 2-times-MST actual cable length.

MST vs. Distribution+Drop in Crystal, MN

We continue our examination of experienced relationships between Minimum Spanning Tree length and the actual length of distribution cable plus drops, in this case in an urban area of single-family dwellings in Crystal, MN. The density in both cases is just above 3,000 households per square mile, so both fit into the 2550-5000 / sq mi density zone. In that zone, the DPS recommends an average drop length of 80 feet; Bill Fitzsimmons, in his direct testimony, recommends an average drop length of 83 feet. Though the two numbers are very close, we will calculate distribution-plus-drop both ways.

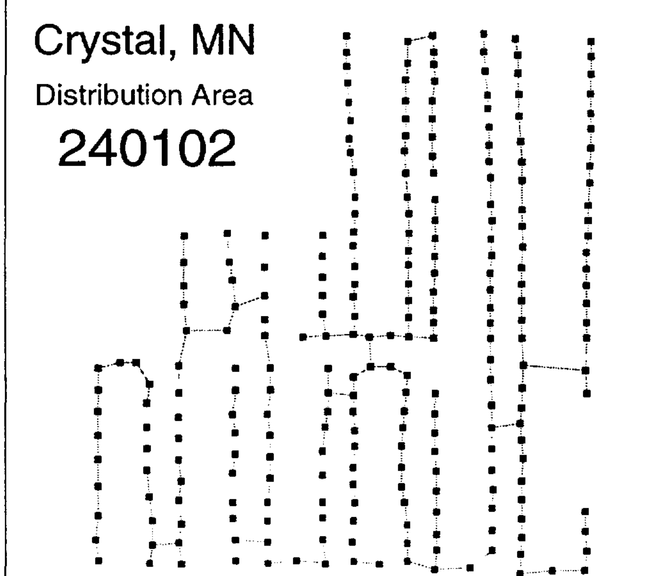


255 Customer Locations

We first consider a distribution area that is nearly regular in shape, and is compact. Such an area, if it is efficiently cabled (and this one is) should yield distribution-plus-drop lengths which reflect a *relatively low multiplier* of Minimum Spanning Tree length..

This area consists of 255 locations.

The Minimum Spanning Tree of this set of 255 points is calculated to be 20,820 feet.



Minimum Spanning Tree
= 20,820 feet

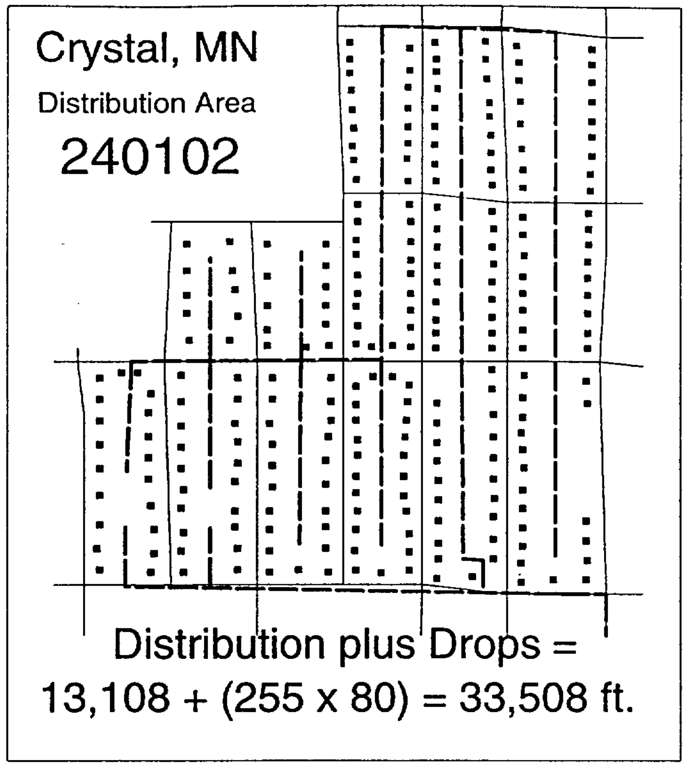
When we transfer the distribution cable routes from the US West cable map, we find that the distribution cable is about 13,108 feet in length. The drops for the 255 locations occupy 20,400 feet (DPS: 80 foot drops), or 21,165 feet (Fitzsimmons: 83 foot drops). Thus the actual distribution-plus-drops is:

- 33,508 feet (DPS drops), or
- 34,273 feet (Fitzsimmons drops)

The actual, then, is:

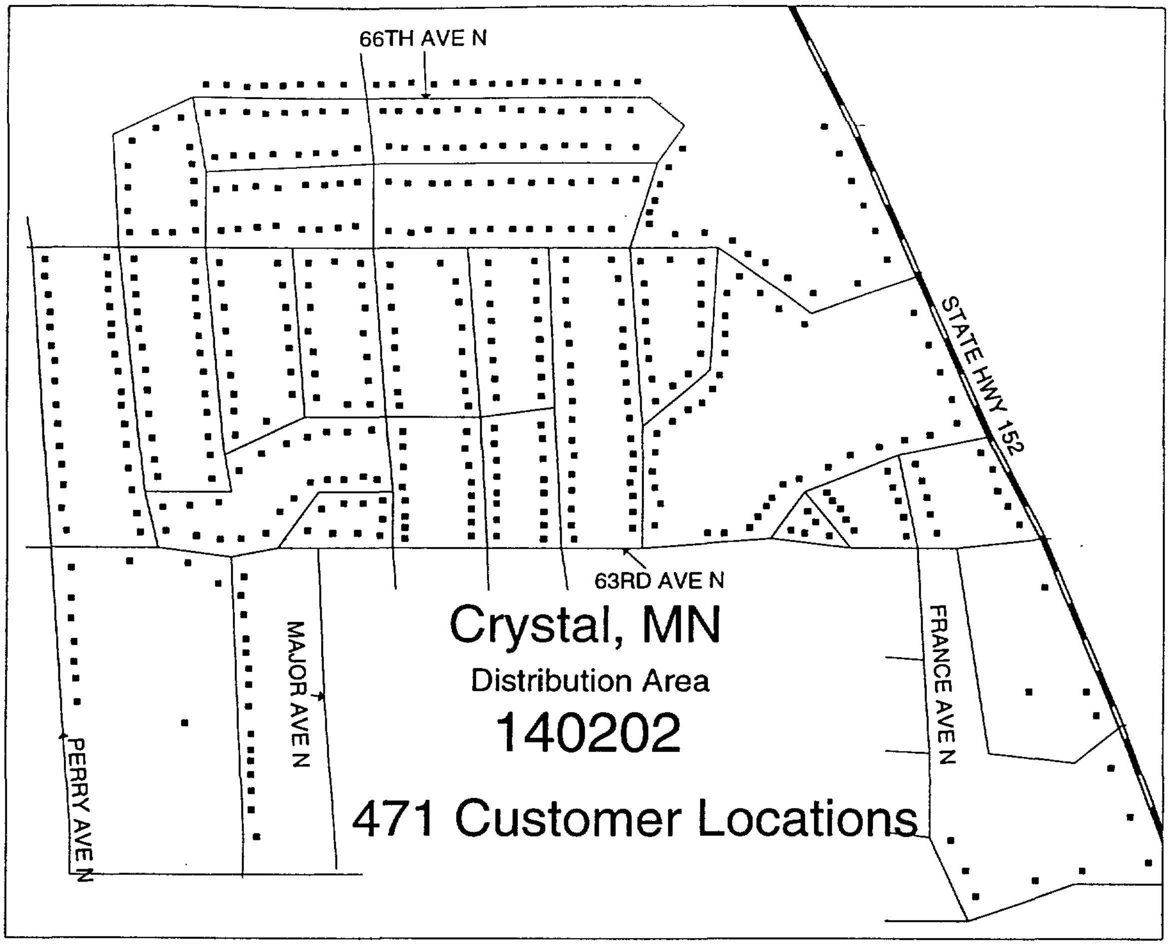
- 1.61 times MST length (DPS), or
- 1.65 times MST length (Fitzsimmons)

We will expect to find multipliers in this range, or higher, in urban areas.

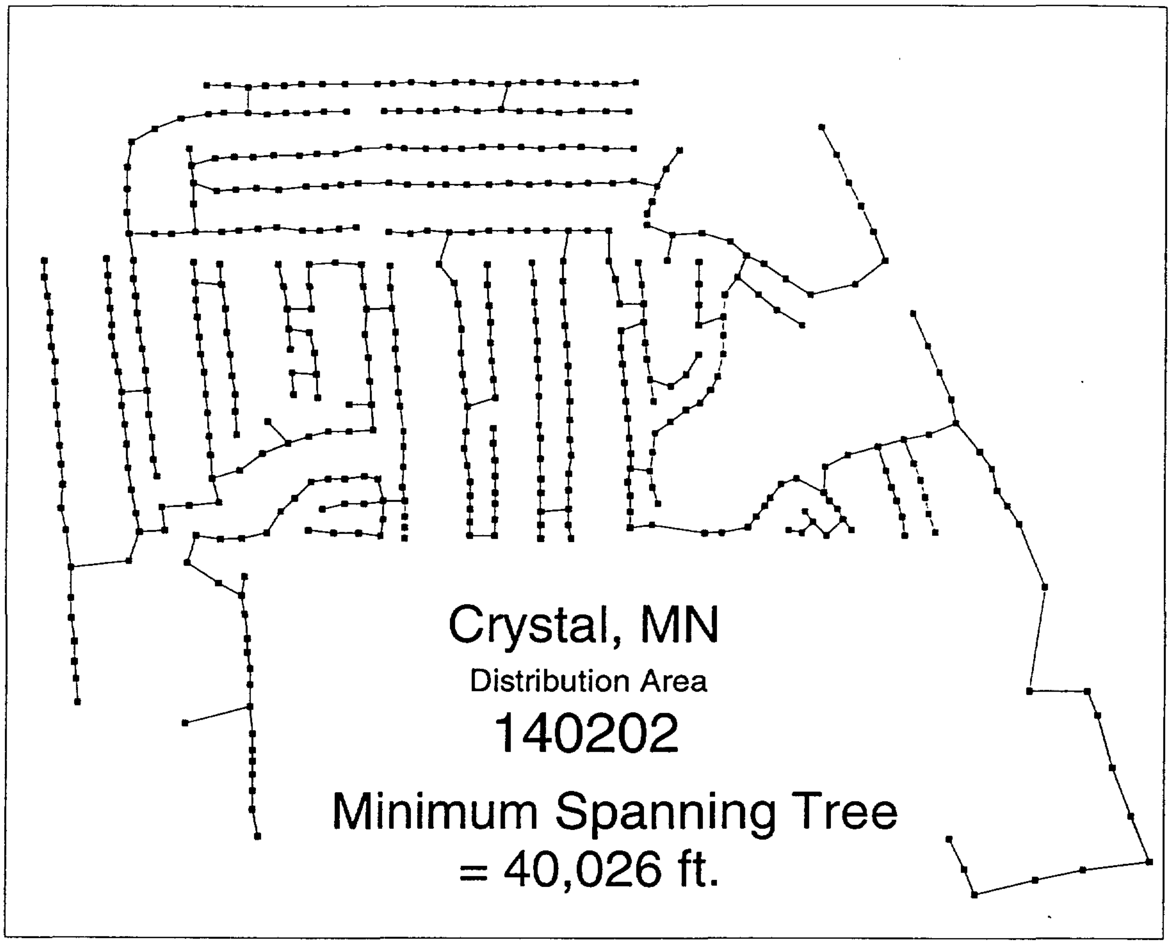


When we look at less regular, and less compact, distribution areas, we ten to see somewhat higher multipliers.

The following distribution area is such an example. It is larger than the previous, and is less regular in shape.



Its Minimum Spanning Tree is calculated to have a length of 40,026 feet.

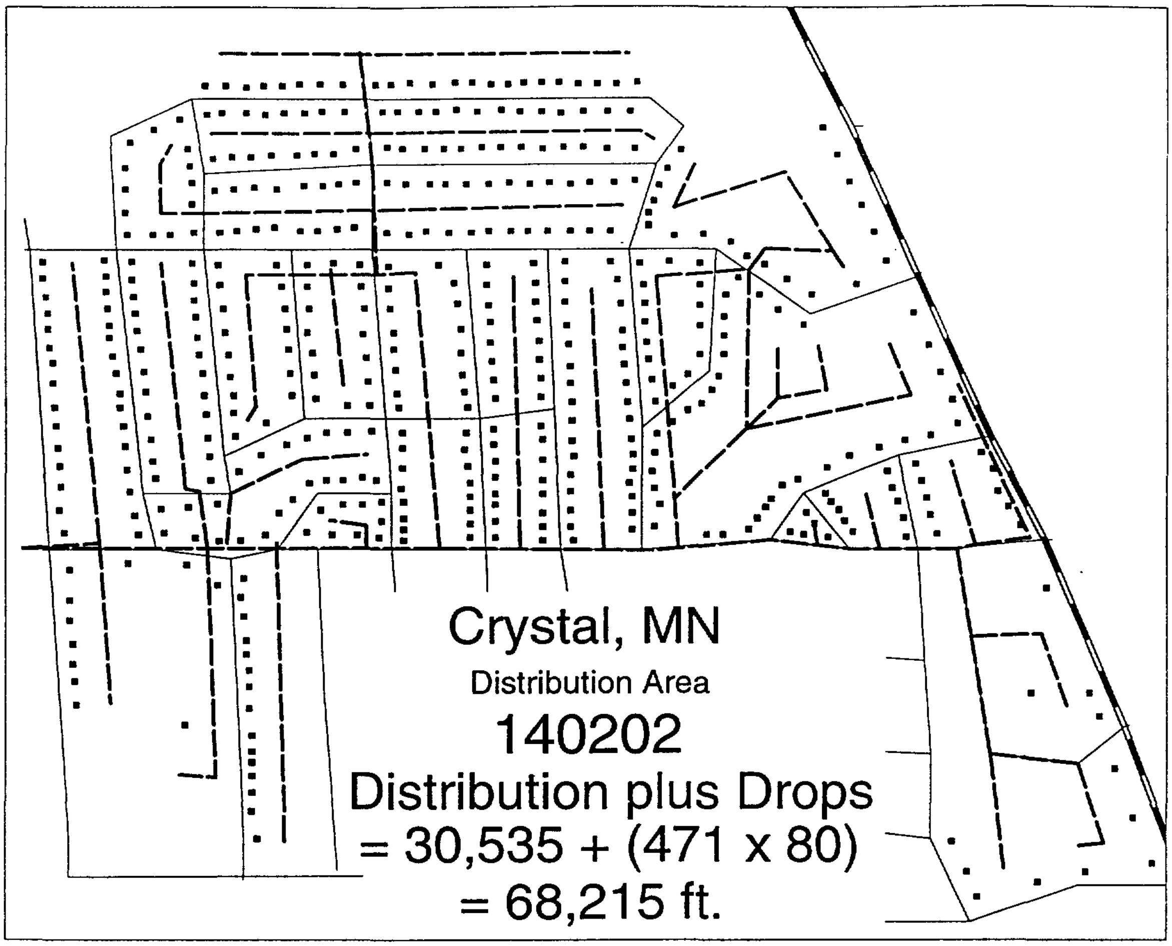


When we plot the distribution cable routes, we find that they total to 30,535 feet. Adding the drops for the 471 locations, we find them to have a length of:

- 37,680 feet (DPS: 80 foot drops), or
- 39,093 feet (Fitzsimmons: 83 foot drops)

Thus, the actual distribution-plus-drop length is calculated to be:

- 68,215 feet (DPS drops), or
- 69,628 feet (Fitzsimmons drops)



The net result is that the actual distribution-plus-drop length in this distribution areas is:

- 1.70 times MST length (DPS), or
- 1.74 times MST length (Fitzsimmons)

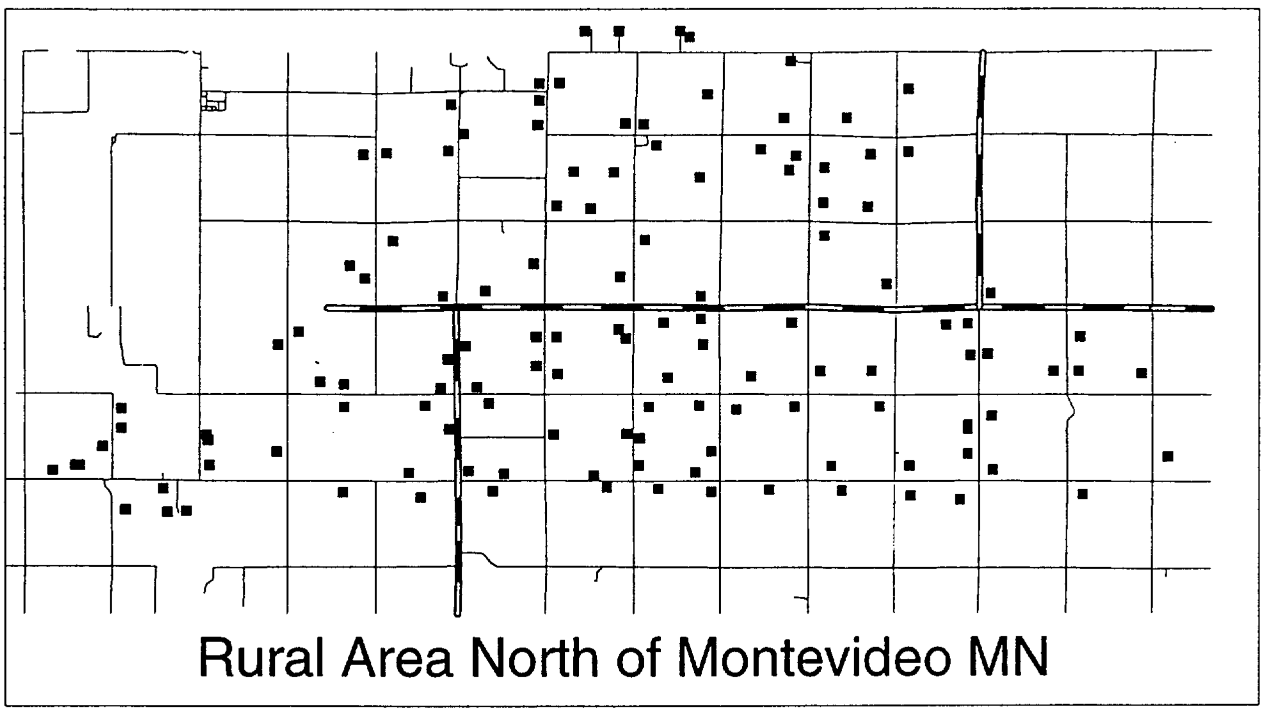
Minimum Spanning Tree and Cabling in a Rural Area

We now cite an example of a rural distribution area, specifically the area north of Montevideo, MN (Chippewa County). As with our urban examples, this area was chosen at random, the only requisite for selection being that maps were available for analysis.

The area in question is a single rural distribution area of about 52 square miles with 129 subscribers ... thus, the density is about 2.5 per square mile. The RAI is located 8 miles due north of Montevideo.

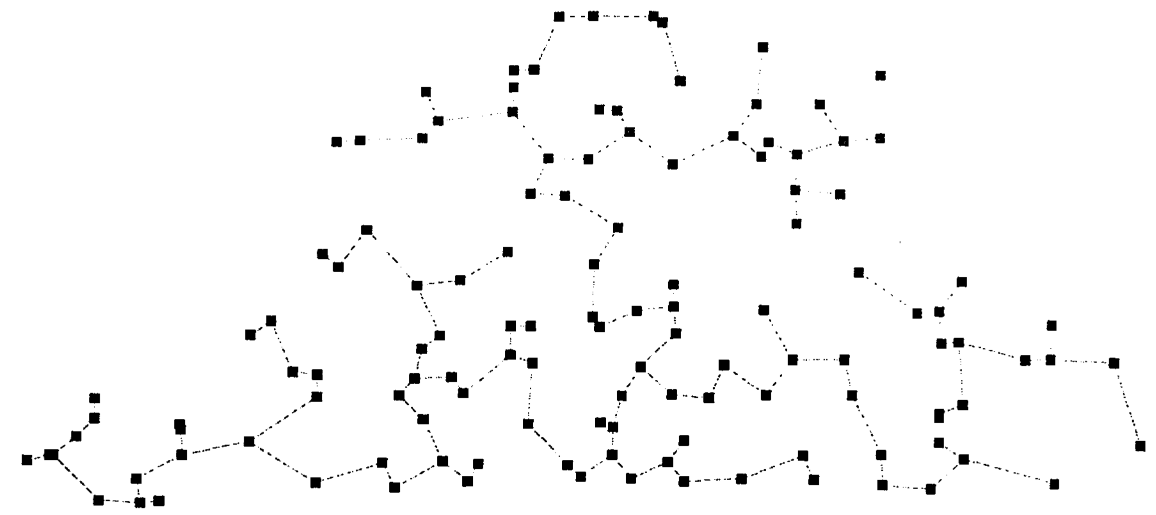
We calculate total cable length using two different measures for average drop length. For the 0-5 per square mile density zone, the DPS specifies an average drop of 250 feet. In his direct testimony, Bill Fitzsimmons specifies an average drop length of 498 feet. Inspection of the maps of this area indicate quite long drops. We calculate total cable length using both numbers.

Here is the layout of the subscribers along roads:



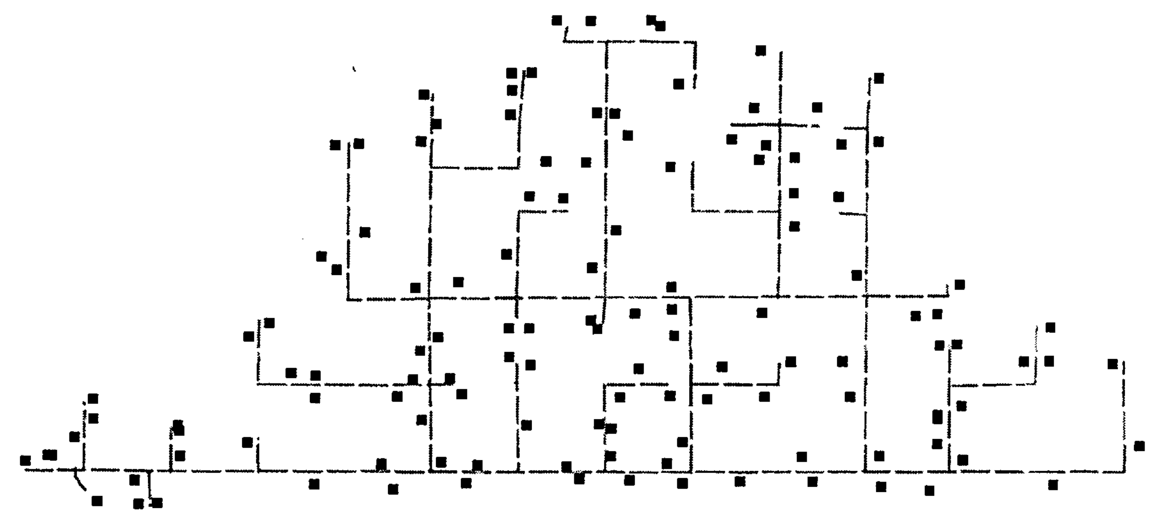
The layout of roads is typical of the township/range/section layout to be found throughout Minnesota. In this case, the area is significantly wider (about 13 miles at its widest point) than it is tall (about 6 miles), which actually reduces the dispersion of the subscriber points.

When we calculate the Minimum Spanning Tree of those 129 points, we find it to be 306,314 feet.



Minimum Spanning Tree of Subscriber Points

When we map the actual distribution cable for this area (which, we would point out, is laid out in a near-optimum fashion), we find that the length of the distribution cable is 325,718 feet ... as we would have expected, the distribution cable alone – in a rural area – is longer than the Minimum Spanning Tree.



Actual Distribution Cabling for Subscribers

The drops add 32,250 feet (DPS: 250 x 129) or 64,242 feet (Fitzsimmons: 498 x 129). We summarize the numbers below (the first column uses the DPS drop length, the second the Fitzsimmons drop length):

Minimum Spanning Tree	306,314 ft.	306,314 ft.
Distribution Cable	325,718 ft.	325,718 ft.
Drops	32,250 ft.	64,242 ft.
	------------	------------
Distribution plus drops	357,968 ft.	389,960 ft.
Actual-to-MST Multiplier	1.17	1.27

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

REBUTTAL TESTIMONY OF CARL H. LAEMMLI

ON BEHALF OF SPRINT-FLORIDA, INCORPORATED

DOCKET 980696-TP

SEPTEMBER 2, 1998

Q. Please state your name, business address, employer and current position.

A. My name is Carl H. Laemmli. My business address is 4220 Shawnee Mission Parkway, Suite 203A, Fairway, Kansas 66205. I am presently employed as Senior Manager – Network Costing for Sprint/United Management Company. I am testifying on behalf of Sprint-Florida, Incorporated (hereafter referred to as "Sprint" or the "Company").

Q. Please describe your educational background and business experience.

A. I received a Bachelor of Science degree in Business Administration from Central Missouri State University in 1983.

I have 22 years of experience in Local Loop planning, design, construction, costing and Customer Service Operations in rural, urban and suburban environments. My experience includes Line and Staff responsibilities for local loop design; new technology evaluation and support, Operational Support System (OSS) design and implementation; Network and Operations Policy development, Policy development and implementation of Network and Operational support for Competitive Local Exchange Carriers (CLEC's) for both ILEC and CLEC operations. I am currently responsible for network and operations costing for unbundled network elements, universal service fund and other product offerings.

From 1976 to 1978 I performed contract engineering design work of urban local loops for Southwestern Bell Telephone Company and rural multi-party elimination projects for United Telephone in Missouri. (Sprint).

From 1978 to 1985, I was employed by United Telephone (Sprint) with responsibility for local loop planning, design, costing and construction, including copper loops, Digital Subscriber Loop Carrier (DLC), as well as local and interoffice fiber optic cable.

I worked on United Telephone's (Sprint's) Texas operations staff from 1985 to 1987 with responsibility for Customer Service Operations methods and OSS implementation.

From 1987 to 1994, with United Telephone (Sprint) in New Jersey, I held positions of Network Engineering Manger, (Responsible for Outside Plant (OSP) and Special Circuit Engineering), Service Center Manager (Responsible for Dispatch, Assignment, Testing and the Repair Call Center) and Area Service Manager (Responsible for Residential and Small Business Customer Installation, Repair and Network Maintenance).

From 1994 to the present I have held several corporate staff positions with Sprint/United Management Company. I have had responsibility for: Network Support of Access Restructuring; New network technology assessment/implementation; OSS development, Network and Operations Policy Development; Results development, Operations and Network Policy and Methods development for Unbundled Network Element and Resale implementation. I have also been responsible for the development of the Operations infrastructure for Sprint – National Integrated Services, Sprint's CLEC. I am currently responsible for network and operations costing for unbundled network elements, universal service fund and other product offerings.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to respond to the direct testimony and exhibits of Mr. James W. Wells testifying on behalf of MCI Telecommunications Corporation and Mr. Don J. Woods testifying on behalf of AT&T Communications of the Southern States and MCI Telecommunications with respect to the validity of certain HAI Model assumptions and inputs.

My rebuttal testimony will:

- Discuss proper geographic sizing of Carrier Serving Areas (CSA) and the impact that this sizing will have on enhanced services and USF model outcomes.
- Identify realistic structure sharing opportunities; show that the HAI structure sharing inputs are completely unsupported, based on pure conjecture, and are not achievable today or in the future.
- Demonstrate that the HAI national default plant mix percentages are irrelevant and inappropriate to Florida conditions, and are not supported by fact.
- Show that AT&T and MCI's assumption of using copper "T1" to serve remote customers is not forward-looking and will deprive rural customers of access to enhanced services.

In addition, my testimony will identify instances in which AT&T and MCI misquote, omit key information and misapply technical references; instances in which AT&T and MCI state one set of assumptions in their documentation and then fail to apply those assumption in the HAI model; and instances in which model assumptions are not followed consistently. The impact of these omissions and changes is to consistently understate USF costs. All citations identified by footnotes are provided in Exhibit CHL Rebuttal 1.

Carrier Serving Area (CSA) Sizing

Q. Have you had the opportunity to review the HAI *Model Description* and HAI Inputs Portfolio (HIP) filed by Mr. Don Wood and Mr. James Wells relative the engineering design of Carrier Serving Areas (CSAs)?

A. Yes.

Q. Does Sprint have any concerns regarding the CSA engineering design principles used by the HAI Model?

A. Yes. In defining the engineering principles behind CSA design, Bellcore states that:

> The evolution of the network that can provide digital services using distribution plant facilities has led to the development of the CSA Concept. A CSA is a geographical area that is, or could be served by, a DLC from a single remote terminal site and within which all loops, without conditioning or design, are

capable of providing conventional voice-grade message service, digital data service up to 64 kbs, and some 2-wire, locally switched voice-grade special services[1]

Essentially, Bellcore defined the "forward-looking technology" that serves as the basis for both the HAI and BCPM cost proxy models. At issue is the proper CSA geographic size. That is, what is the furthest distance that a customer should be from the Digital Loop Carrier? Sprint supports 12,000 feet (12 kft). AT&T and MCI, through the HAI model inputs, support 18,000 feet (18 kft).

This issue is important because it has an impact on network cost and the ability of the network to support advanced services. In general, the larger CSA's proposed by AT&T and MCI will result in lower costs, since there are fewer DLC's required. However, that will impede the provision of advanced services because of the longer distances from the DLC to the customer.

AT&T and MCI support an 18,000 foot CSA based on a single reference to a Bellcore document. In their documentation, AT&T and MCI misrepresent a statement supporting 18,000 foot CSAs to be a direct quote from the referenced Bellcore document. The Bellcore reference is clearly taken out of context. It refers to a plant design that requires load coils and is, therefore, clearly not forward-looking nor relevant to this proceeding.

Furthermore, the quotation has been materially altered from the original source which actually recommends CSA placements beginning at 24,000 feet, not 18,000 feet.

Finally, 18,000 foot CSA sizes are inconsistent with industry practice, and other Bellcore and AT&T documentation.

Q. On page 36 of the HIP, section 2.7.6, AT&T and MCI provide a direct quote from Bellcore document, *BOC Notes on the Network – 1994, p.12-4*[2] as supporting an 18,000 foot maximum distance from the Central Office to the customer. Does this document, in fact, support an 18,000 foot maximum distance?

A. No, it does not. This reference has been taken completely out of context and is actually referring to a network design that is not forward-looking and has no relevance to this proceeding.

The AT&T/MCI citation refers *only* to the "Revised Resistance Design" (RRD) method of designing local POTS loops, not to CSA design. The RRD method is not a forward-looking design method, as it recommends load coils on pairs that extend between 18,000 feet and 24,000 feet from the central office. In its order in the USF Docket, the FCC specifically states that load coils are inconsistent with the required forward looking network design. The order states, "Load coils should not be used because they impede the provision of advanced services."[3] AT&T and MCI's technical reference to an 18,000 foot CSA is totally irrelevant to this proceeding.

Additionally, in what is represented by AT&T and MCI to be a direct quote from this Bellcore document, the quotation has been materially altered to support their position.